

A Magical *Mystery* Tour:
Respiratory Pharmacology
Update 2022

Disclosure statement

PAUL THILL, PHARMD - SPEAKER

*HAS DECLARED THAT HE HAS NO COMMERCIAL INTERESTS OR
CONFLICTS AND THEREFORE HAS NOTHING TO DISCLOSE.*

Learning Objectives

By the end of this presentation, the participant should be able to....

- Describe epidemiologic trends affecting local and global asthma outcomes and recommendations
- Explain to patients the changes to asthma classification and associated changes to the idea of controllers and quick relievers for asthma
- Suggest when it is appropriate to add an inhaled corticosteroid for a patient with COPD
- Recognize the complexity of adherence issues with COPD

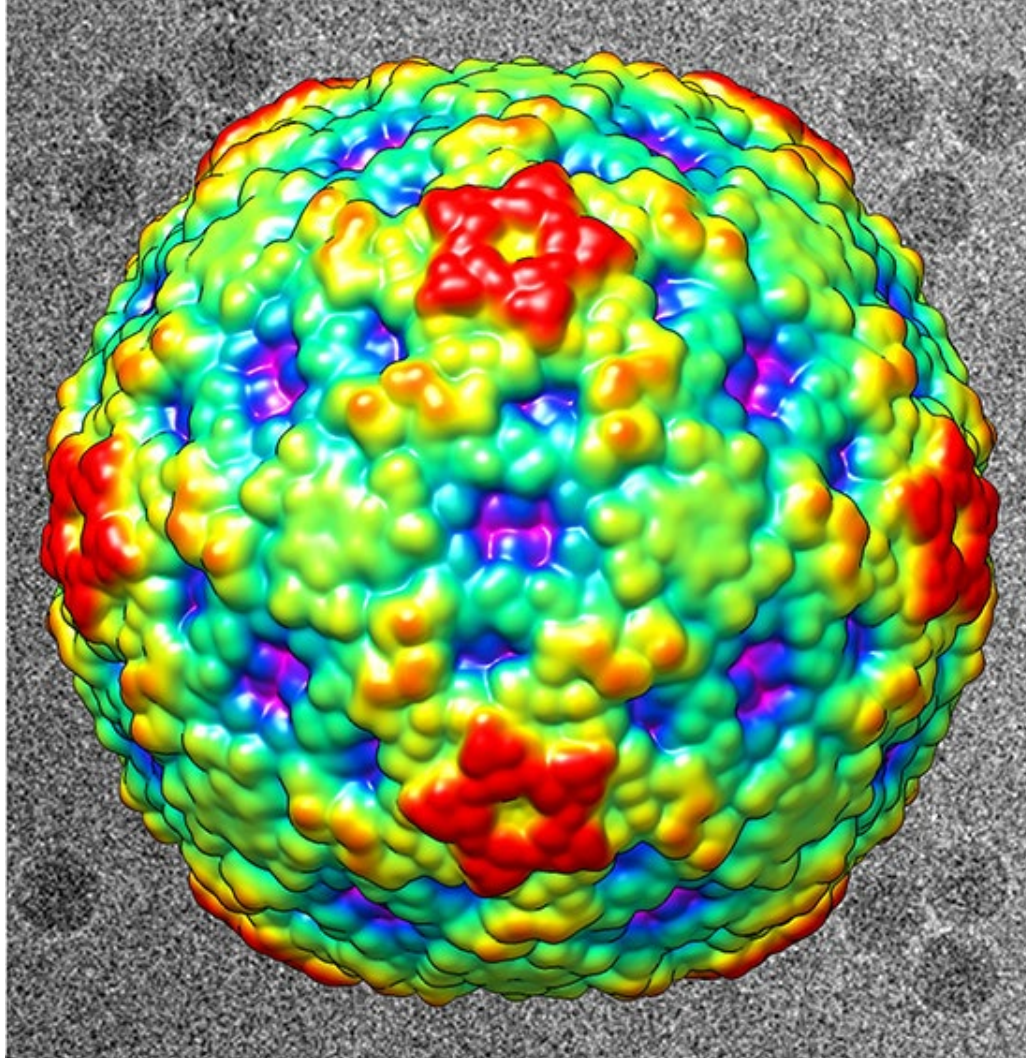
Overview

Asthma

- Epidemiology update
- Definition changes
- Recommendation changes

COPD

- Initial therapy vs. follow-up
- ICS addition & triple therapy
- Adherence complexity



Asthma Update EV-D68

HAS ANYBODY NOTICED A
LITTLE MORE PEDS
ASTHMA LATELY?

Enterovirus-D68

- One of 100 non-polio enteroviruses
- Typically respiratory illness – mild to severe
- Nationwide outbreak in 2014 – led to surveillance expansion
 - Respiratory – affected younger peds, asthma patients (immunity)
 - Acute flaccid myelitis – rare neurologic complication
- No specific treatment – supportive
- “What should people with asthma... (kids with RAD) do” – CDC
 - Discuss an update to your asthma action plan with your PCP
 - Take your medicine; stick with asthma action plan
 - If symptoms don’t go away, seek medical attention

Enterovirus (EV-D68) is spreading at high levels in the U.S.

Health care providers should consider EV-D68 as a cause of severe respiratory disease in children



EV-D68 is associated with acute flaccid myelitis (AFM), a rare, serious neurologic condition.

Hospitalize for AFM symptoms; refer to specialty care

*Percentage of positive EV-D68 test results among children younger than 18 years of age with acute respiratory illness and positive rhinovirus/enterovirus test results

bit.ly/mm7146e1

SEPTEMBER 27, 2022

CDC.gov

MMWR

Biofire Respiratory Panel

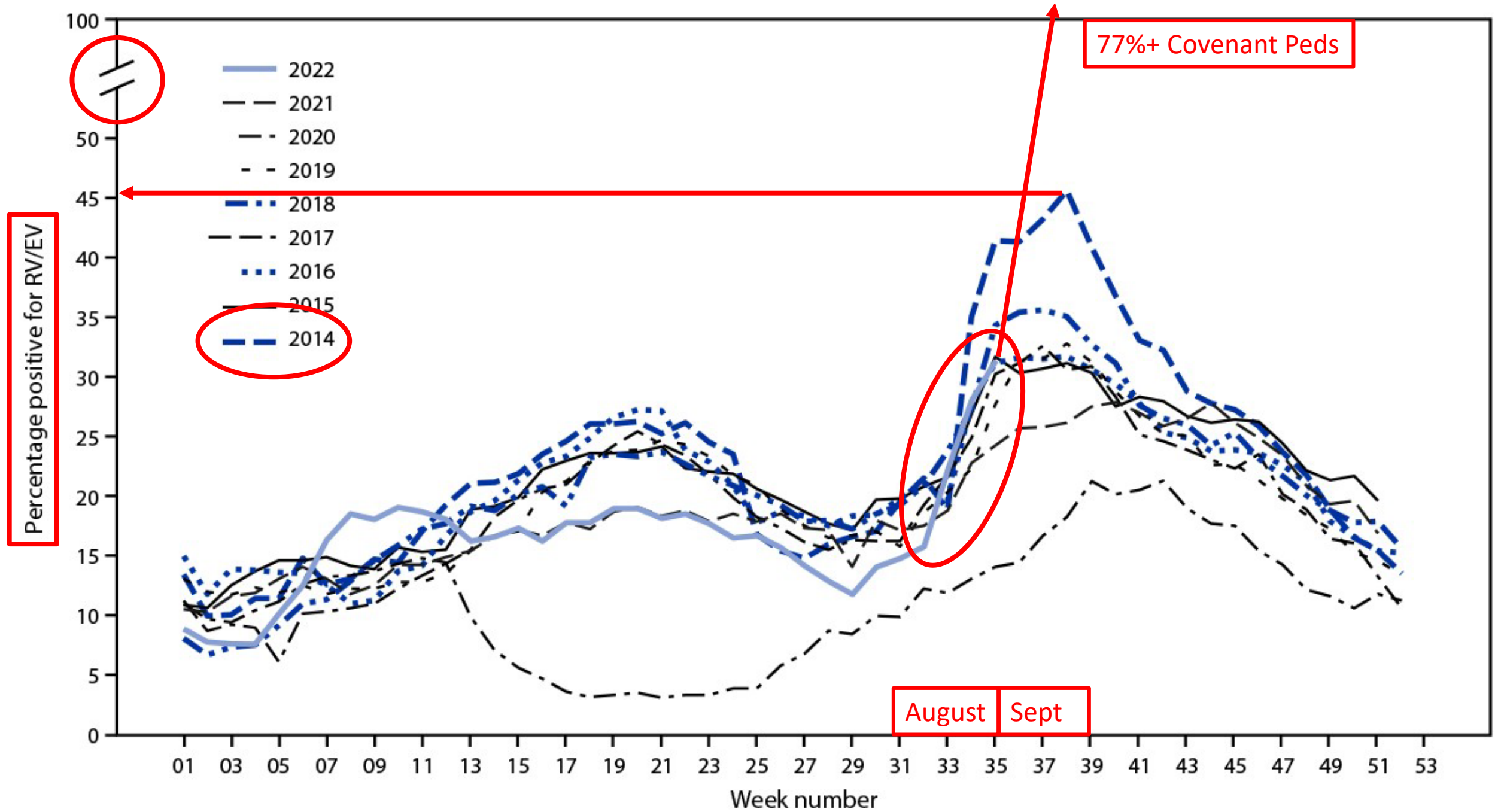
! Respiratory Pathogen Panel (PCR Filmarray-20)

Status: Final result Visible to patient: No (not released) Next appt: 10/17/2022 at 02:30 PM in

Specimen Information: Nasopharynx; Nasopharyngeal

0 Result Notes

Component	Ref Range & Units	10/10/22 2139
Adenovirus	Not Detected	Not Detected
Corona 229	Not Detected	Not Detected
Coronavirus HKU1	Not Detected	Not Detected
Coronaviru NL	Not Detected	Not Detected
Coronavirus OC43	Not Detected	Not Detected
SARS-CoV-2	Not Detected	Not Detected
Human Metapneumovirus	Not Detected	Not Detected
Rhinovirus/Enterovirus	Not Detected	Detected !
Influenza A	Not Detected	Not Detected
Influenza B	Not Detected	Not Detected
Parainfluenza 1	Not Detected	Not Detected
Parainfluenza 2	Not Detected	Not Detected
Parainfluenza 3	Not Detected	Not Detected
Parainfluenza 4	Not Detected	Not Detected
RSV	Not Detected	Not Detected
Bordetella Parapertussis	Not Detected	Not Detected
Bordetella Pertussis	Not Detected	Not Detected
Chlamydia pneumoniae	Not Detected	Not Detected
Mycoplasma pneumoniae	Not Detected	Not Detected

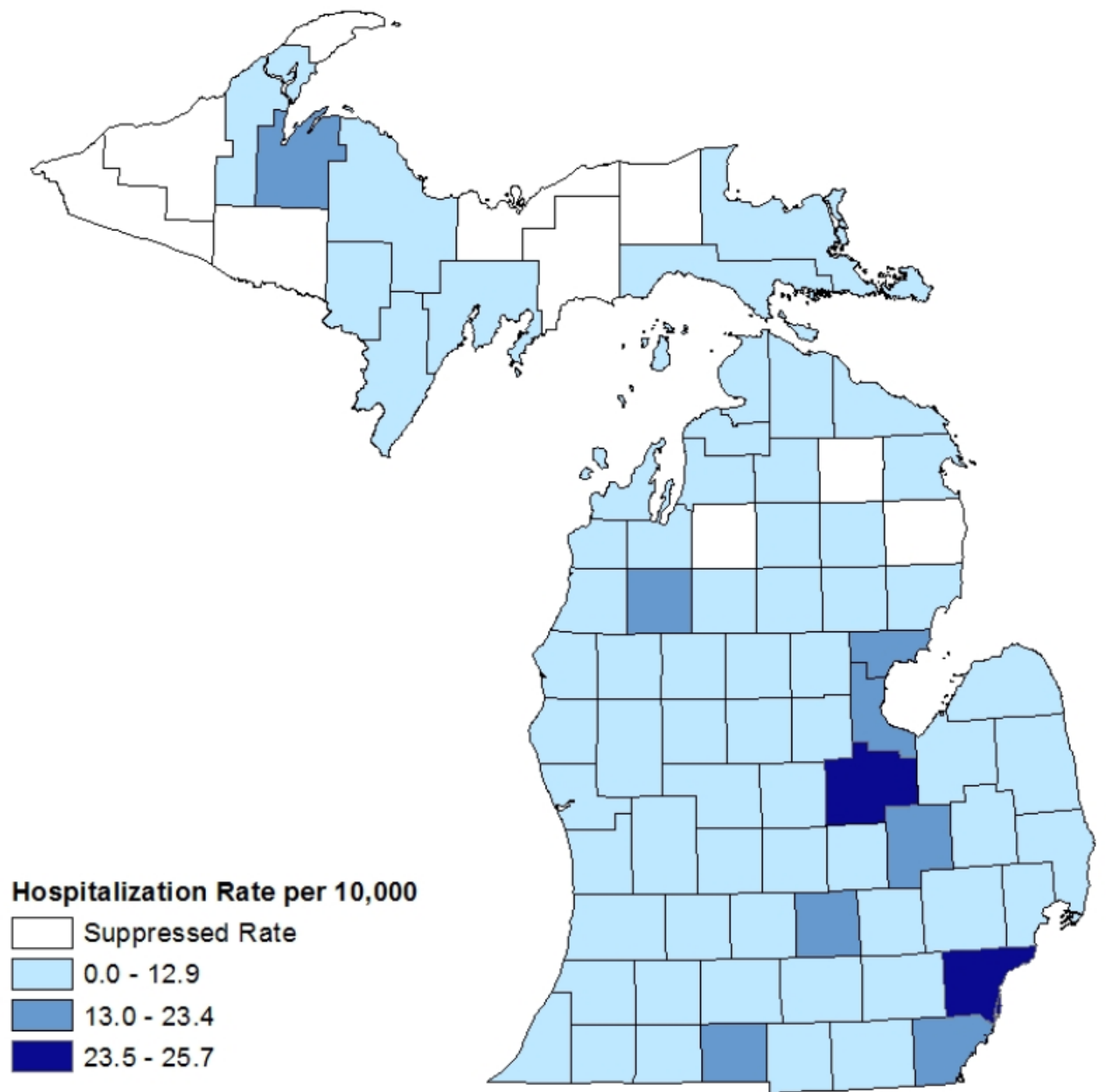


Epidemiology of Asthma in Saginaw

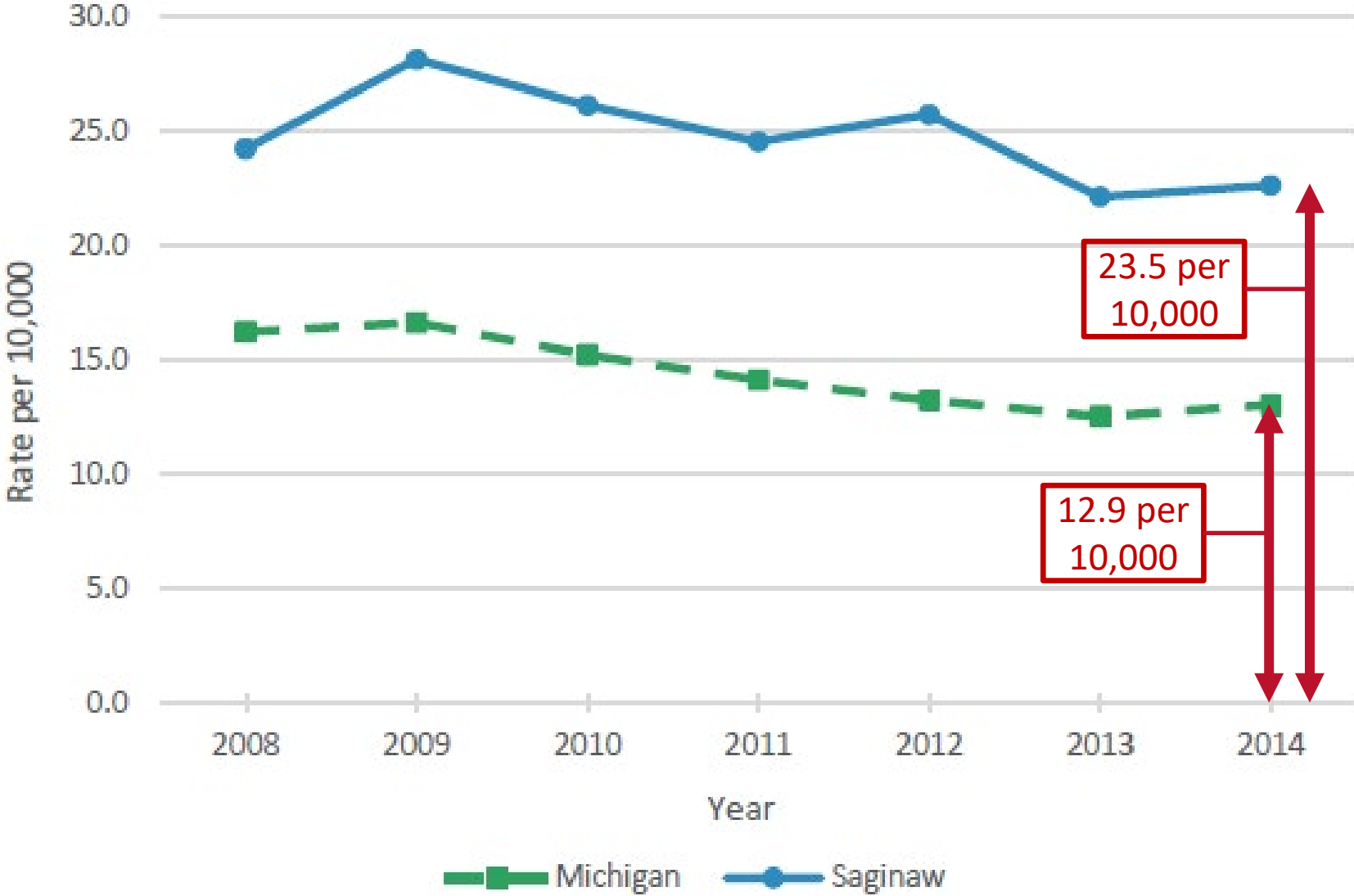
Key Findings:

- Asthma burden in Saginaw County is greater than Michigan
- Saginaw County hospitalization rate 89% higher than rate for Michigan
- Saginaw County asthma mortality rate twice as high as rate for Michigan
- Fewer Saginaw peds Medicaid patients had PCP asthma visits
- More Saginaw peds Medicaid patients had ED visits for asthma

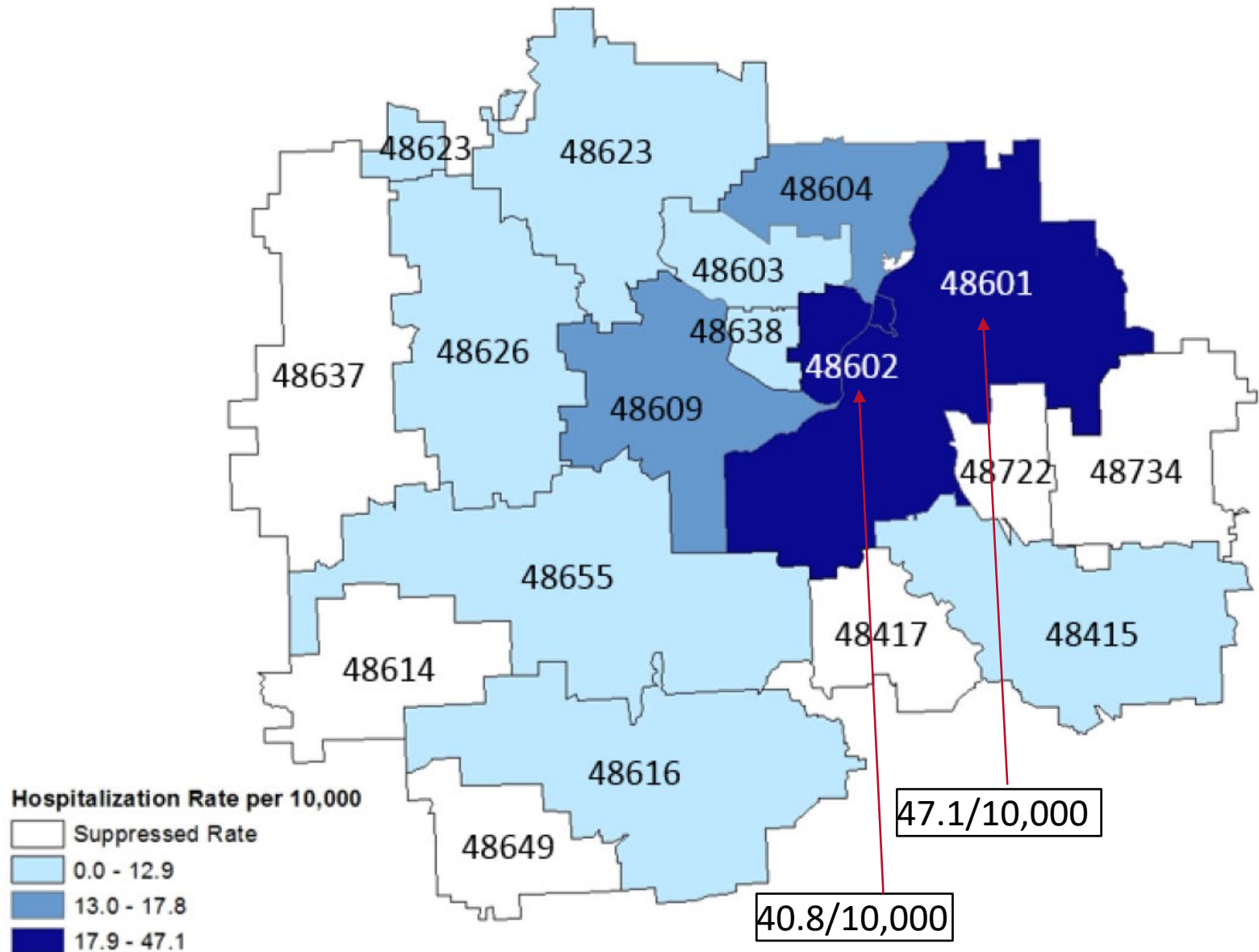
Hospitalization Rate by County



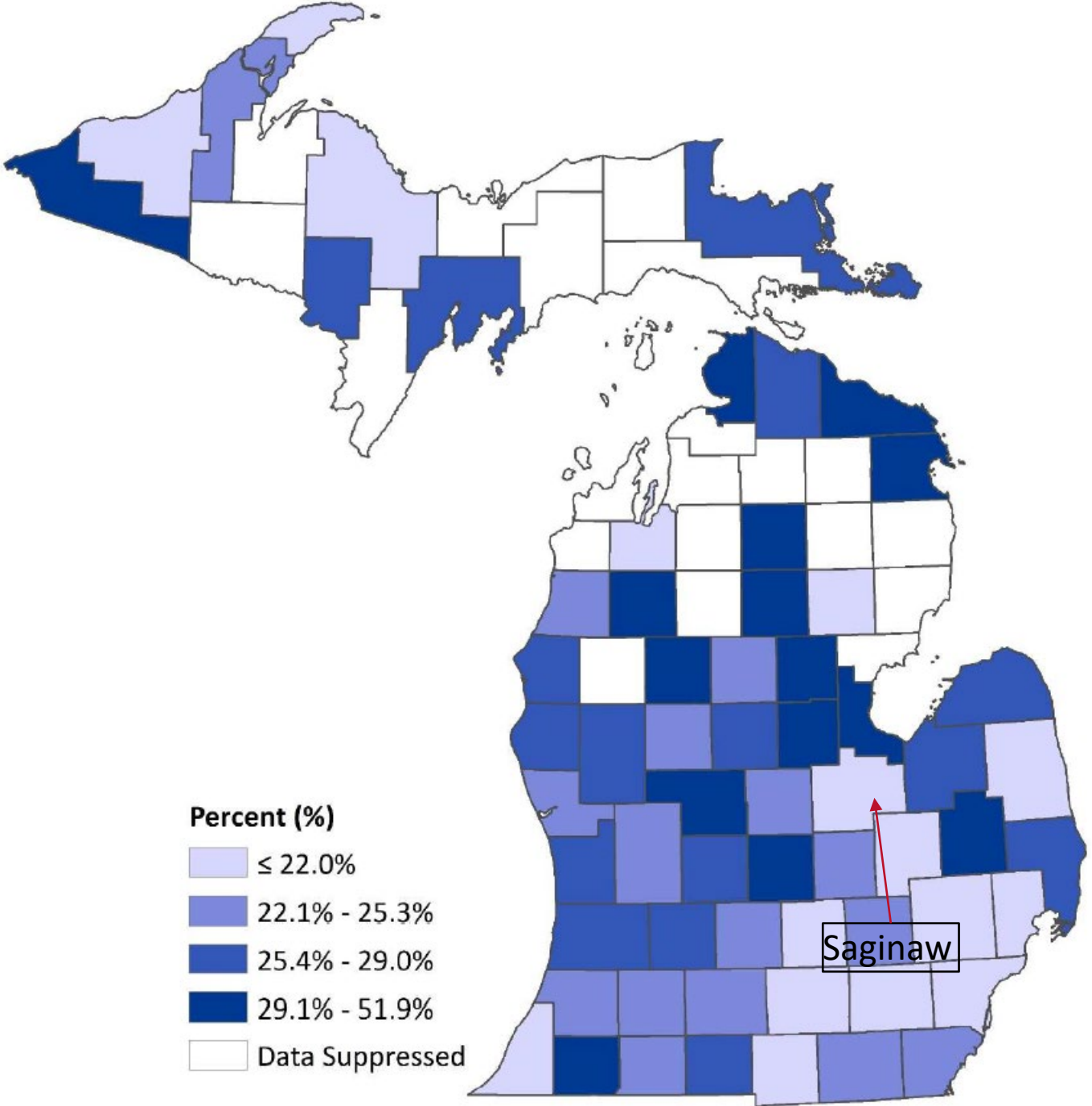
Saginaw County asthma hospitalization rate



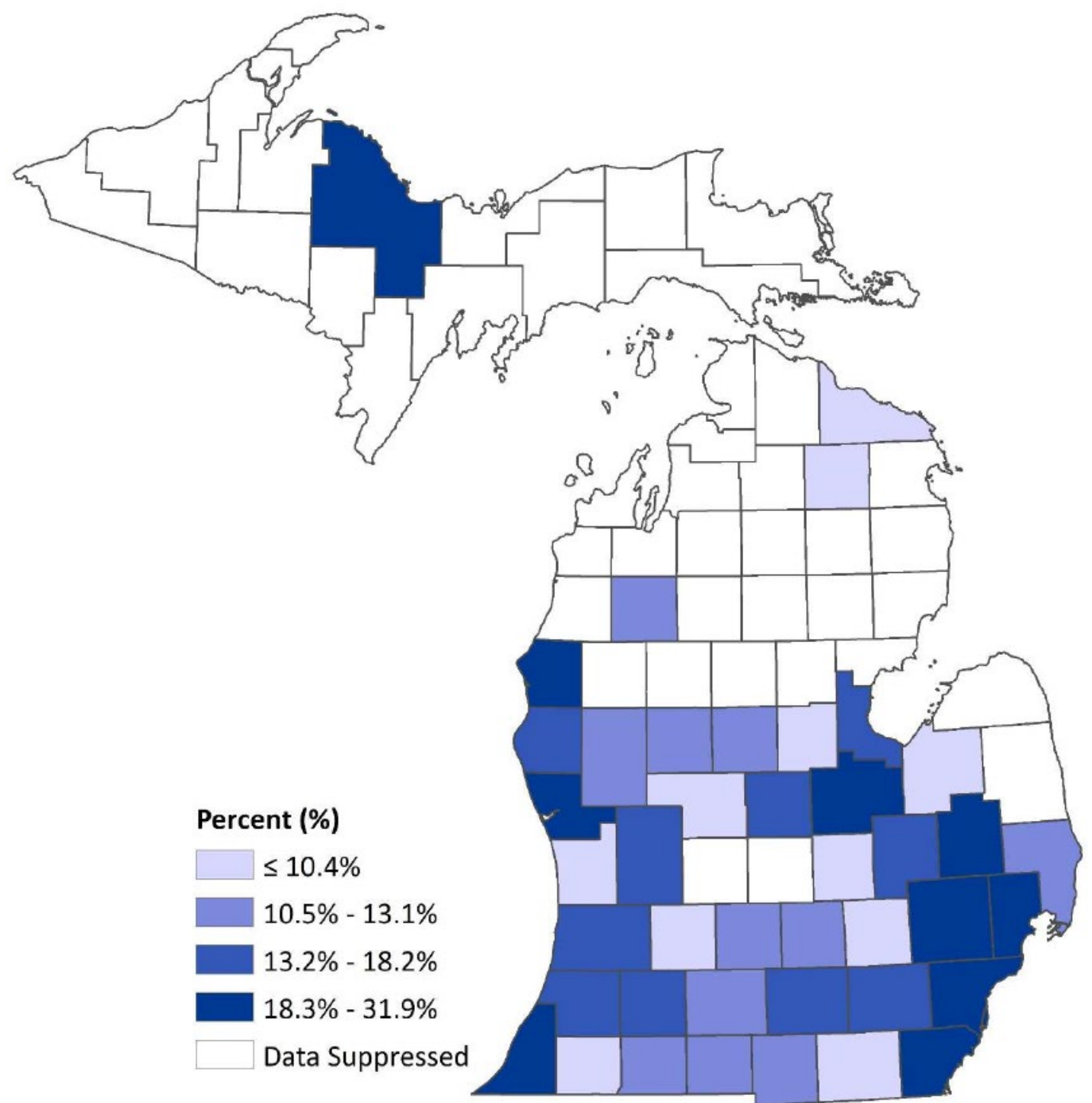
Saginaw county hospitalization rate by zip code



Controller Medication Adherence $\geq 75\%$



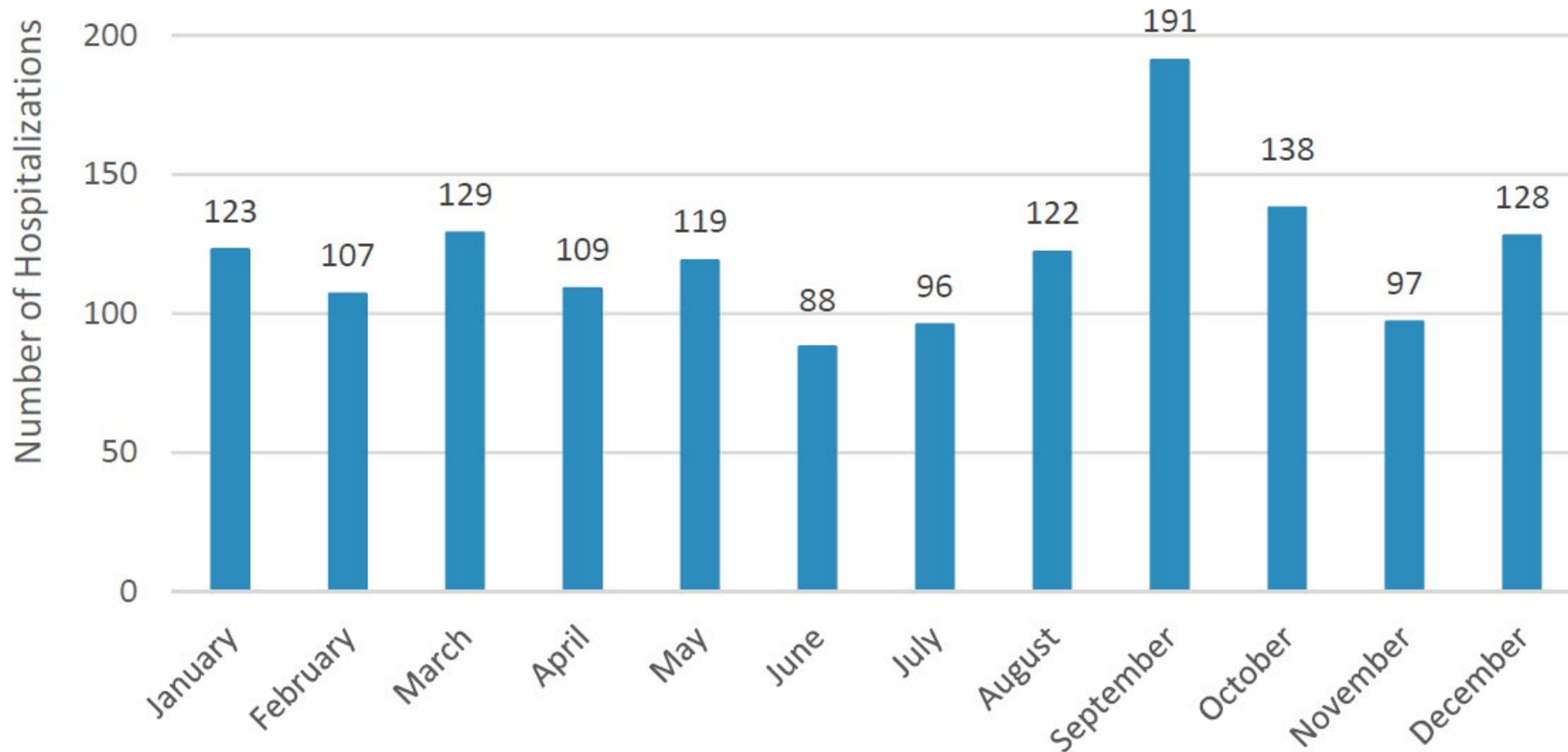
Reliance on ED for Outpatient Care (%)





*Can I take (or increase) my controller
...at the change of the seasons?
...at the first sign of symptoms?
...when I'm in the Yellow Zone?*

Hospitalizations 2012-14, Saginaw









EDITORIAL
GINA 2019

GINA 2019: a fundamental change in asthma management

Treatment of asthma with short-acting bronchodilators **alone** is no longer recommended for adults and adolescents

Helen K. Reddel ¹, J. Mark FitzGerald², Eric D. Bateman³, Leonard B. Bacharier⁴, Allan Becker⁵, Guy Brusselle⁶, Roland Buhl⁷, Alvaro A. Cruz⁸, Louise Fleming ⁹, Hiromasa Inoue¹⁰, Fanny Wai-san Ko ¹¹, Jerry A. Krishnan¹², Mark L. Levy ¹³, Jiangtao Lin¹⁴, Søren E. Pedersen¹⁵, Aziz Sheikh¹⁶, Arzu Yorgancioglu¹⁷ and Louis-Philippe Boulet¹⁸

A
THE MOS

ARS

Why not treat with SABA (albuterol) alone?

- Inhaled SABA alone was first-line treatment for asthma for 50 years
 - Asthma was thought to be a disease of bronchoconstriction
 - Role of SABA reinforced by rapid relief of symptoms and low cost
- Regular SABA, even 1–2 wk, assoc with ↑AHR, ↓bronchodil, ↑allergic response, ↑eos
 - Can lead to a vicious cycle encouraging overuse
 - SABA associated with ↑ exacerbations and ↑ mortality
 - LABAs were given FDA boxed warning 2012; removed for ICS-LABA in 2018
- Starting SABA alone trains patient it is 1^o treatment
- Previous option: daily ICS, but adherence poor
- GINA changed rec once validated evidence available

Background - the risks of 'mild' asthma

- Patients with apparently mild asthma still at risk of severe attack
 - 30–37% of adults with acute asthma
 - 16% of patients with near-fatal asthma
 - 15–27% of adults dying of asthma
- } had symptoms less than weekly in previous 3 months (*Dusser, Allergy 2007; Bergstrom, 2008*)
- Triggers unpredictable (viruses, pollens, pollution,)
 - Even 4–5 lifetime OCS courses increase the risk of osteoporosis, diabetes, cataracts (*Price et al, J Asthma Allerg 2018*)

PRN ICS-formoterol in mild asthma

- Meta-analysis of four all RCTs, n=9,565
- 55% reduction in severe exacerbations compared with SABA alone
- Similar risk of severe exacerbations as with daily ICS + as-needed SABA
- ED visits or hospitalizations
 - 65% lower than with SABA alone
 - 37% lower than with daily ICS



PRN

VS.



BID

+



PRN

SMART and as-needed therapies in mild-to-severe asthma: a network meta-analysis

- SMART (Single inhaler Maintenance and Reliever Therapy) and PRN ICS-LABA
- Included data from 21 studies; n=32,096 patients
- Studies 6-12 mo duration
- Considered mild-severe asthma studies
- In mild-mod, low-dose **PRN** ICS-LABA more effective than sched ICS + SABA prn
- In mod-severe asthma, Low-med dose SMART = sched HD ICS-LABA + SABA prn
- Primary endpoint: SMART and as-needed ICS-formoterol are effective strategies
 - Low-dose SMART and PRN ICS-LABA are best option in adults w/ mild-to-moderate asthma
 - At least, if not more effective at preventing the risk of severe asthma exacerbation
 - SABA administered as monotherapy should be avoided in all asthmatic patients

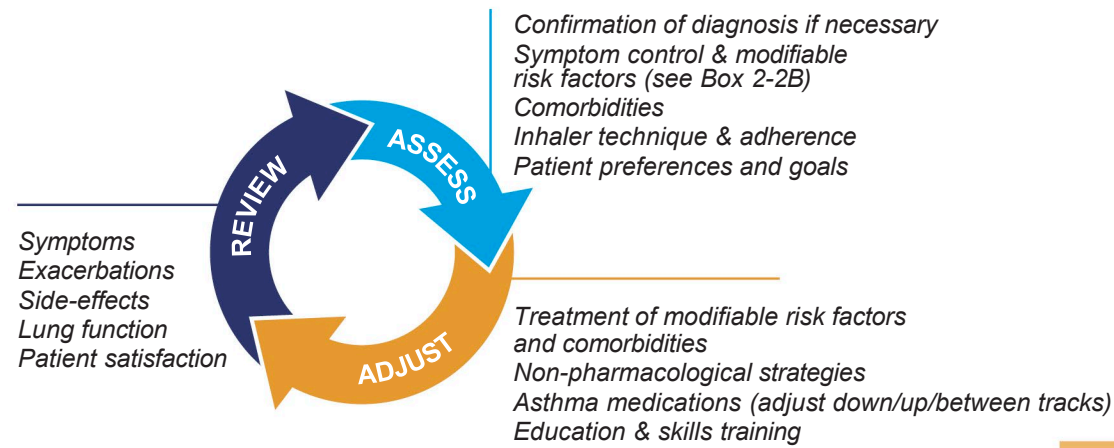
I have “mild” “intermittent” asthma

‘Mild’ asthma, in clinical practice

- We suggest that the term ‘mild asthma’ should generally be avoided in clinical practice, because of the common assumption by patients and clinicians that it equates to low risk. Instead, describe the patient’s symptom control and risk factors on their current treatment (p.33).
- If the term ‘mild asthma’ needs to be used in clinical practice, qualify it with a reminder that patients with infrequent or mild asthma symptoms can still have severe or fatal exacerbations,^{160,161} and that this risk is reduced by half to two-thirds with low dose ICS or as-needed low-dose ICS-formoterol.^{162,163}
 - GINA ’22
 - “Hold a stakeholder discussion about the concept of asthma severity”
 - Further discussion is clearly needed

Adults & adolescents 12+ years

Personalized asthma management
Assess, Adjust, Review
for individual patient needs



CONTROLLER and PREFERRED RELIEVER
(Track 1). Using ICS-formoterol as reliever reduces the risk of exacerbations compared with using a SABA reliever

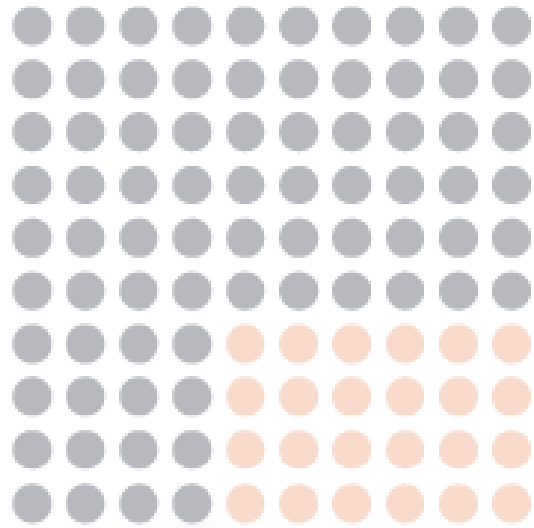
STEPS 1 – 2 As-needed low dose ICS-formoterol	STEP 3 Low dose maintenance ICS-formoterol	STEP 4 Medium dose maintenance ICS-formoterol	STEP 5 Add-on LAMA Refer for assessment of phenotype. Consider high dose maintenance ICS-formoterol, ± anti-IgE, anti-IL5/5R, anti-IL4R, anti-TSLP
RELIEVER: As-needed low-dose ICS-formoterol			

See GINA severe asthma guide

CONTROLLER and ALTERNATIVE RELIEVER
(Track 2). Before considering a regimen with SABA reliever, check if the patient is likely to be adherent with daily controller

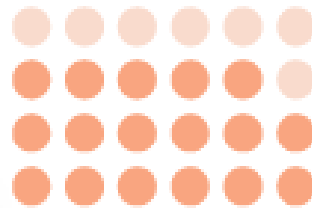
STEP 1 Take ICS whenever SABA taken	STEP 2 Low dose maintenance ICS	STEP 3 Low dose maintenance ICS-LABA	STEP 4 Medium/high dose maintenance ICS-LABA	STEP 5 Add-on LAMA Refer for assessment of phenotype. Consider high dose maintenance ICS-LABA, ± anti-IgE, anti-IL5/5R, anti-IL4R, anti-TSLP	
RELIEVER: As-needed short-acting beta₂-agonist					
<i>Other controller options for either track (limited indications, or less evidence for efficacy or safety)</i>		<i>Low dose ICS whenever SABA taken, or daily LTRA, or add HDM SLIT</i>	<i>Medium dose ICS, or add LTRA, or add HDM SLIT</i>	<i>Add LAMA or LTRA or HDM SLIT, or switch to high dose ICS</i>	<i>Add azithromycin (adults) or LTRA. As last resort consider adding low dose OCS but consider side-effects</i>

Difficult-to-treat vs. Severe Asthma



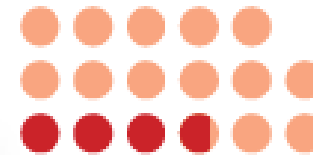
24%

● GINA Step 4-5 treatment



17%

● difficult-to-treat asthma
= GINA Step 4-5 treatment
+ poor symptom control



3.7%

● severe asthma
= GINA Step 4-5 treatment
+ poor symptom control
+ good adherence and
inhaler technique

Investigate and manage adult and adolescent patients with difficult-to-treat asthma



Consider referring to specialist or severe asthma clinic at any stage

Consider referring to specialist or severe asthma clinic at any stage

DIAGNOSIS: "Difficult-to-treat asthma"

1 Confirm the diagnosis (asthma/differential diagnoses)

3 Optimize management, including:

4 Review response after ~3-6 months

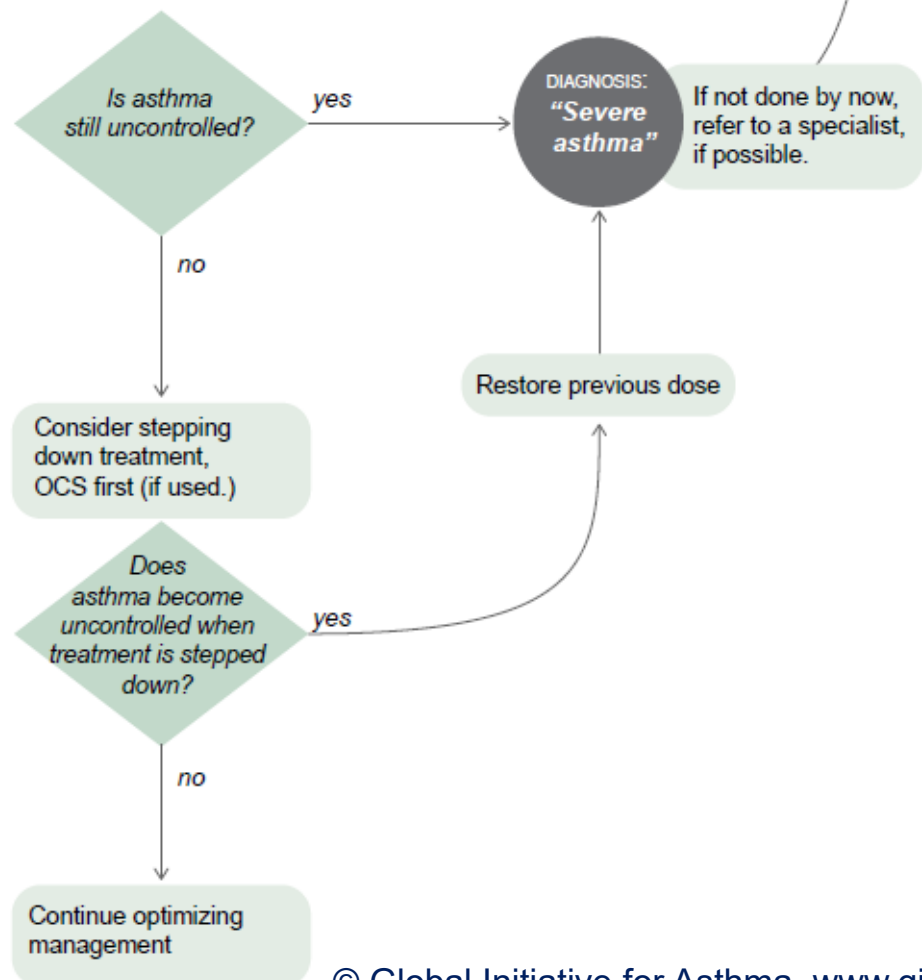
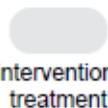
For adolescents and adults with symptoms and/or exacerbations despite GINA Step 4 treatment, or taking maintenance OCS

2 Look for factors contributing to symptoms, exacerbations and poor quality of life:

- Incorrect inhaler technique
- Suboptimal adherence
- Comorbidities including obesity, GERD, chronic rhinosinusitis, OSA
- Modifiable risk factors and triggers at home or work, including smoking, environmental exposures, allergen exposure (if sensitized on skin prick testing or specific IgE); medications such as beta-blockers and NSAIDs
- Overuse of SABA relievers
- Medication side effects
- Anxiety, depression and social difficulties

- Asthma education
- Optimize treatment (e.g. check and correct inhaler technique and adherence; switch to ICS-formoterol maintenance and reliever therapy, if available)
- Treat comorbidities and modifiable risk factors
- Consider non-biologic add-on therapy (e.g. LABA, tiotropium, LM/LTRA, if not used)
- Consider non-pharmacological interventions (e.g. smoking cessation, exercise, weight loss, mucus clearance, influenza vaccination)
- Consider trial of high dose ICS, if not used

Key

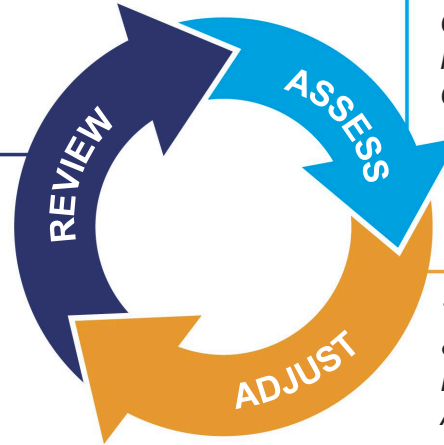


Children 6-11 years

Personalized asthma management:

Assess, Adjust, Review

Symptoms
Exacerbations
Side-effects
Lung function
Child and parent satisfaction



Confirmation of diagnosis if necessary
Symptom control & modifiable risk factors (see Box 2-2B)
Comorbidities
Inhaler technique & adherence
Child and parent preferences and goals

Treatment of modifiable risk factors & comorbidities
Non-pharmacological strategies
Asthma medications (adjust down or up)
Education & skills training

Asthma medication options:

Adjust treatment up and down for individual child's needs

PREFERRED CONTROLLER

to prevent exacerbations and control symptoms

	STEP 1 Low dose ICS taken whenever SABA taken	STEP 2 Daily low dose inhaled corticosteroid (ICS) (see table of ICS dose ranges for children)	STEP 3 Low dose ICS-LABA, OR medium dose ICS, OR very low dose* ICS-formoterol maintenance and reliever (MART)	STEP 4 Medium dose ICS-LABA, OR low dose† ICS-formoterol maintenance and reliever therapy (MART). Refer for expert advice	STEP 5 Refer for phenotypic assessment ± higher dose ICS-LABA or add-on therapy, e.g. anti-IgE, anti-IL4R
<i>Other controller options (limited indications, or less evidence for efficacy or safety)</i>	<i>Consider daily low dose ICS</i>	<i>Daily leukotriene receptor antagonist (LTRA), or low dose ICS taken whenever SABA taken</i>	<i>Low dose ICS + LTRA</i>	<i>Add tiotropium or add LTRA</i>	<i>Add-on anti-IL5 or, as last resort, consider add-on low dose OCS, but consider side-effects</i>
RELIEVER	As-needed short-acting beta ₂ -agonist (or ICS-formoterol reliever in MART in Steps 3 and 4)				

*Very low dose: BUD-FORM 100/6 mcg
†Low dose: BUD-FORM 200/6 mcg (metered doses).

Asthma Action Plan

For: _____ Doctor: _____ Date: _____
 Doctor's Phone Number _____ Hospital/Emergency Department Phone Number _____

GREEN ZONE

Doing Well

- No cough, wheeze, chest tightness, or shortness of breath during the day or night
- Can do usual activities

And, if a peak flow meter is used,

Peak flow: more than _____
 (80 percent or more of my best peak flow)

My best peak flow is: _____

Take these long-term control medicines each day (include an anti-inflammatory).

Medicine	How much to take	When to take it
_____	_____	_____
_____	_____	_____
_____	_____	_____
Before exercise	<input type="checkbox"/> _____ <input type="checkbox"/> 2 or <input type="checkbox"/> 4 puffs	5 minutes before exercise

YELLOW ZONE

Asthma Is Getting Worse

- Cough, wheeze, chest tightness, or shortness of breath, or
- Waking at night due to asthma, or
- Can do some, but not all, usual activities

-Or-

Peak flow: _____ to _____
 (50 to 79 percent of my best peak flow)



First Add: quick-relief medicine—and keep taking your GREEN ZONE medicine.

_____ 2 or 4 puffs, every 20 minutes for up to 1 hour
(short-acting beta₂-agonist) Nebulizer, once



Second If your symptoms (and peak flow, if used) return to GREEN ZONE after 1 hour of above treatment:

Continue monitoring to be sure you stay in the green zone.

-Or-

If your symptoms (and peak flow, if used) do not return to GREEN ZONE after 1 hour of above treatment:

Take: _____ 2 or 4 puffs or Nebulizer

(short-acting beta₂-agonist)

Add: _____ mg per day For _____ (3–10) days

(oral steroid)

Call the doctor before/ within _____ hours after taking the oral steroid.

RED ZONE

Medical Alert!

- Very short of breath, or
- Quick-relief medicines have not helped, or
- Cannot do usual activities, or
- Symptoms are same or get worse after 24 hours in Yellow Zone

-Or-

Peak flow: less than _____
 (50 percent of my best peak flow)

Take this medicine:

_____ 4 or 6 puffs or Nebulizer
(short-acting beta₂-agonist)

_____ mg
(oral steroid)

Then call your doctor NOW. Go to the hospital or call an ambulance if:

- You are still in the red zone after 15 minutes AND
- You have not reached your doctor.

Asthma Update Summary

- Asthma epidemiology is bad and unchanging; we need to change our approach
- Must move toward PRN and SMART budesonide/formoterol for 12+
- Seasonal controller (ICS) is de-emphasized and not a peds recommendation
- Adherence, technique should be assessed before step up/step, up/down q3 mo
 - Know how to teach the devices!
 - Once adequately trialing & failing step 4+, referral for biologics is appropriate



COPD – GOLD 2019+

SIGNIFICANT ABCD BOX CHANGES

Classic COPD Classification

▶ CLASSIFICATION OF AIRFLOW LIMITATION SEVERITY IN COPD (BASED ON POST-BRONCHODILATOR FEV₁)

In patients with FEV₁/FVC < 0.70:

GOLD 1: Mild FEV₁ ≥ 80% predicted

GOLD 2: Moderate 50% ≤ FEV₁ < 80% predicted

GOLD 3: Severe 30% ≤ FEV₁ < 50% predicted

GOLD 4: Very Severe FEV₁ < 30% predicted

▶ THE REFINED ABCD ASSESSMENT TOOL

Spirometrically
Confirmed Diagnosis



Assessment of
airflow limitation



Assessment of
symptoms/risk
of exacerbations

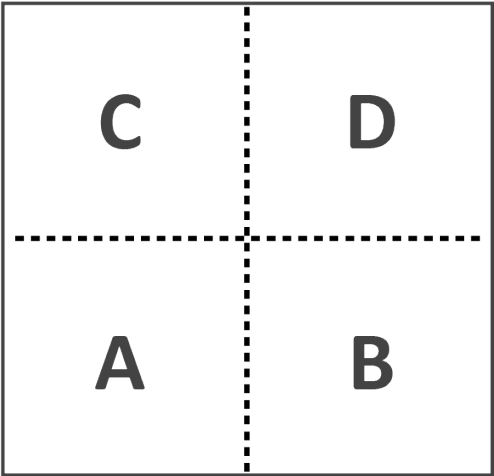
Post-bronchodilator
 $FEV_1/FVC < 0.7$

Grade	FEV_1 (% predicted)
GOLD 1	≥ 80
GOLD 2	50-79
GOLD 3	30-49
GOLD 4	< 30

Moderate or Severe
Exacerbation History

≥ 2 or
 ≥ 1 leading
to hospital
admission

0 or 1
(not leading
to hospital
admission)



mMRC 0-1 CAT < 10	mMRC ≥ 2 CAT ≥ 10
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Symptoms



Treatment of stable COPD

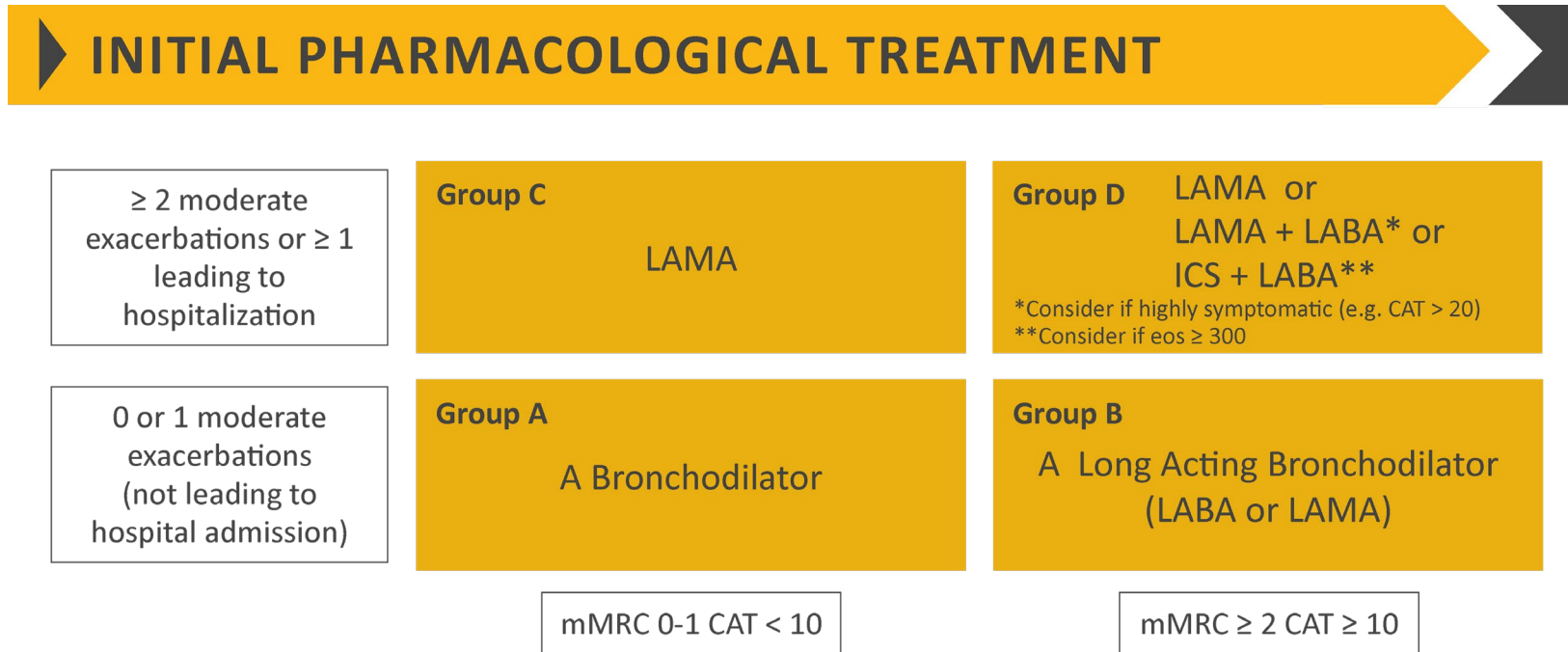


FIGURE 4.1

Definition of abbreviations: eos: blood eosinophil count in cells per microliter; mMRC: modified Medical Research Council dyspnea questionnaire; CAT™: COPD Assessment Test™.



Treatment of stable COPD

- ▶ Following implementation of therapy, patients should be reassessed for attainment of treatment goals and identification of any barriers for successful treatment (**Figure 4.2**).
- ▶ Following review of the patient response to treatment initiation, adjustments in pharmacological treatment may be needed.

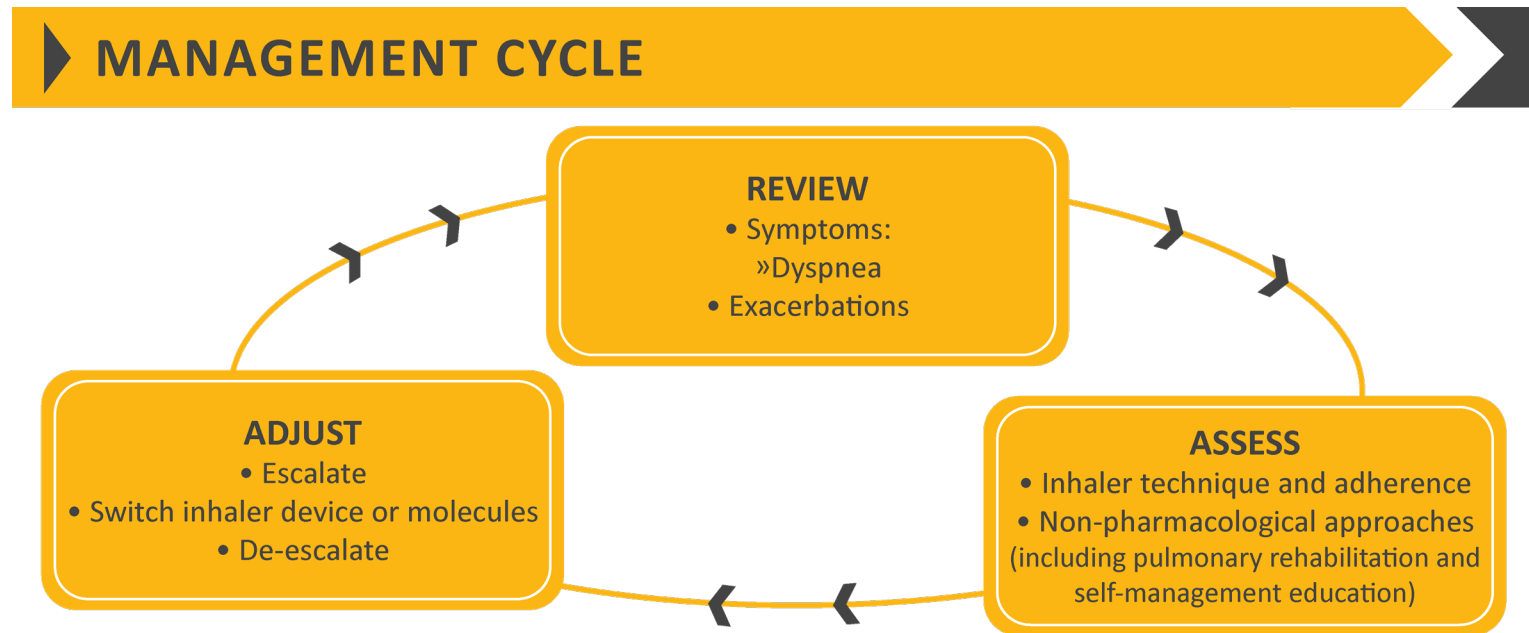
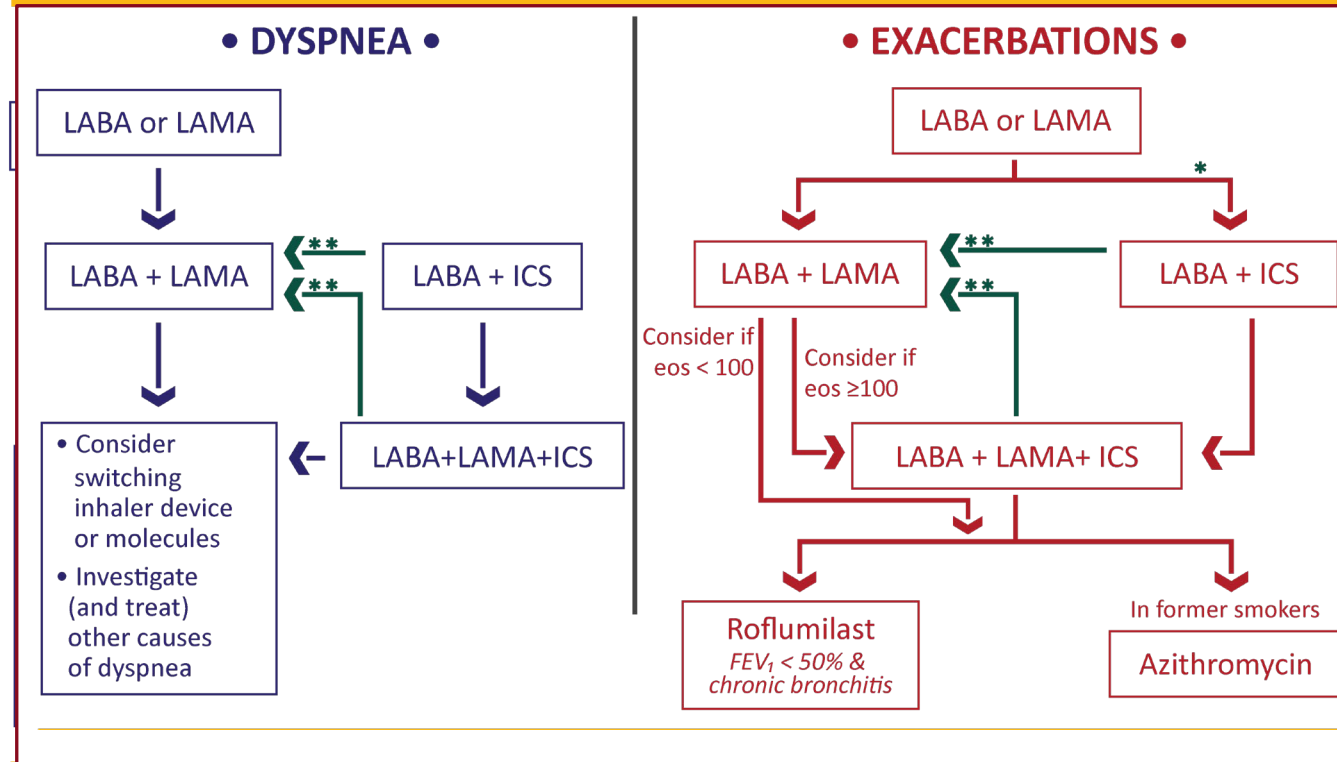


FIGURE 4.2



FOLLOW-UP PHARMACOLOGICAL TREATMENT

1. IF RESPONSE TO INITIAL TREATMENT IS APPROPRIATE, MAINTAIN IT.
2. IF NOT:
 - ✓ Consider the predominant treatable trait to target (dyspnea or exacerbations)
 - Use exacerbation pathway if both exacerbations and dyspnea need to be targeted
 - ✓ Place patient in box corresponding to current treatment & follow indications
 - ✓ Assess response, adjust and review
 - ✓ These recommendations do not depend on the ABCD assessment at diagnosis



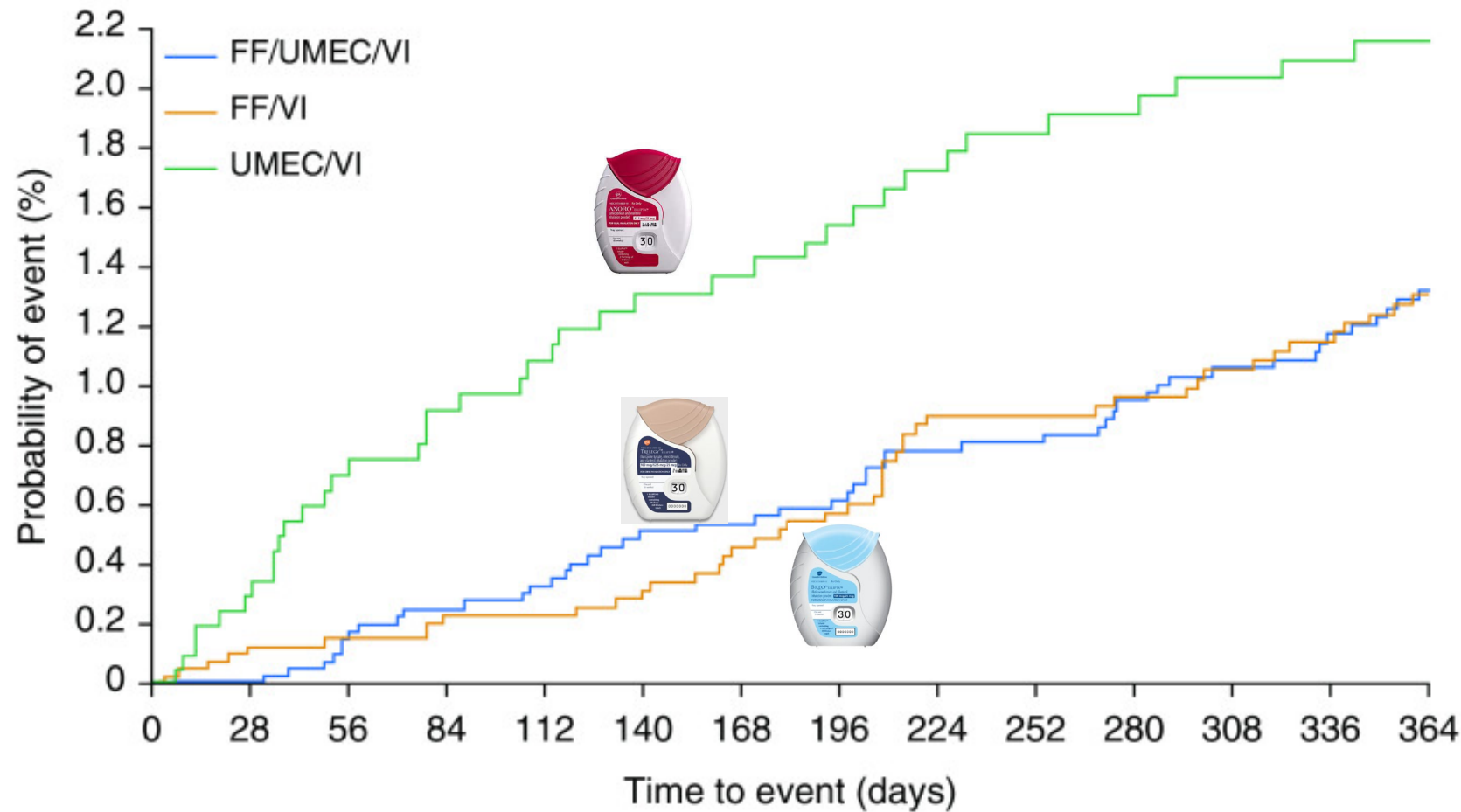
eos = blood eosinophil count (cells/ μ L)

** Consider if eos \geq 300 or eos \geq 100 AND \geq 2 moderate exacerbations / 1 hospitalization*

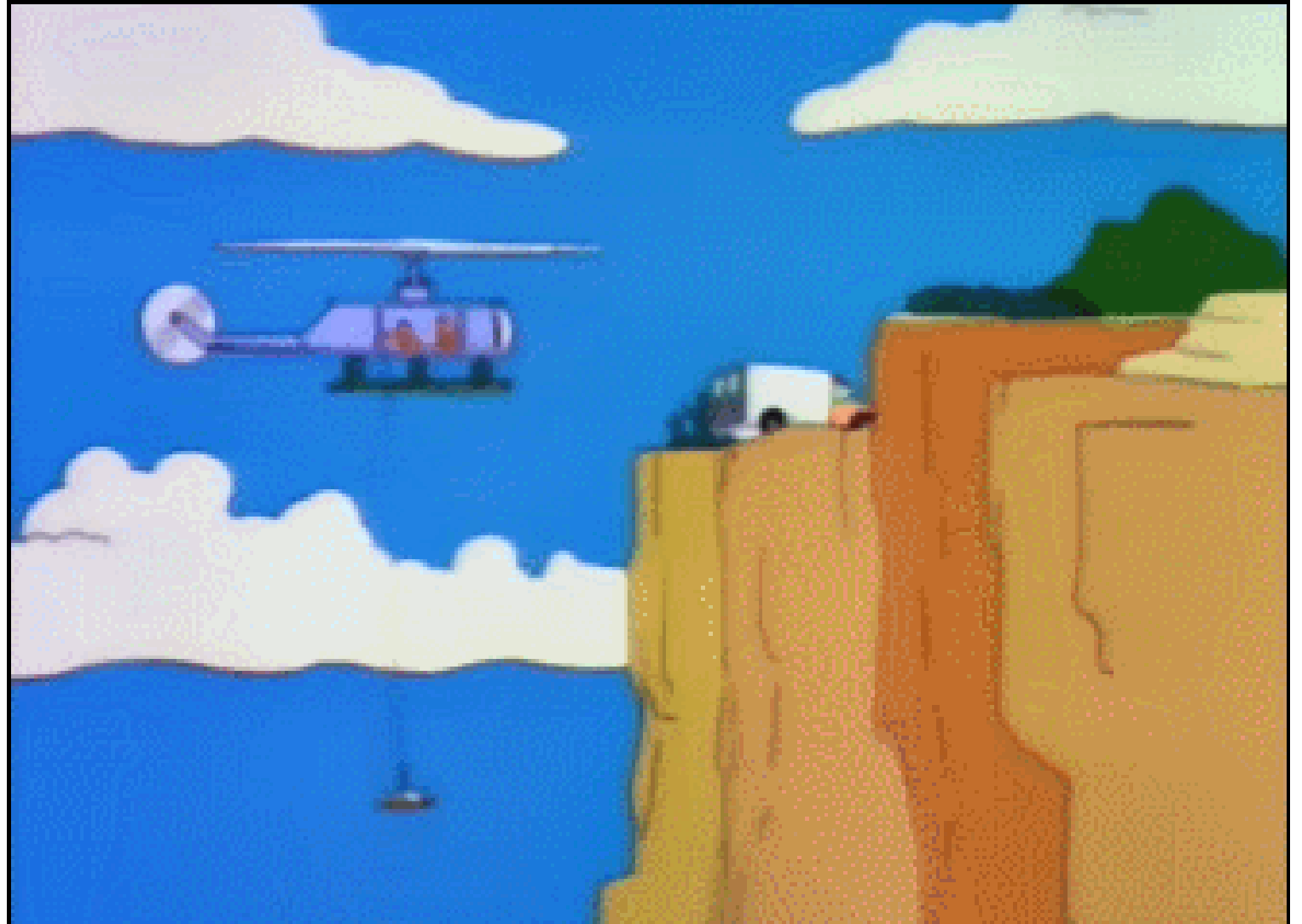
*** Consider de-escalation of ICS or switch if pneumonia, inappropriate original indication or lack of response to ICS*

FIGURE 4.3

Triple Therapy (LABA/LAMA/ICS) and Mortality

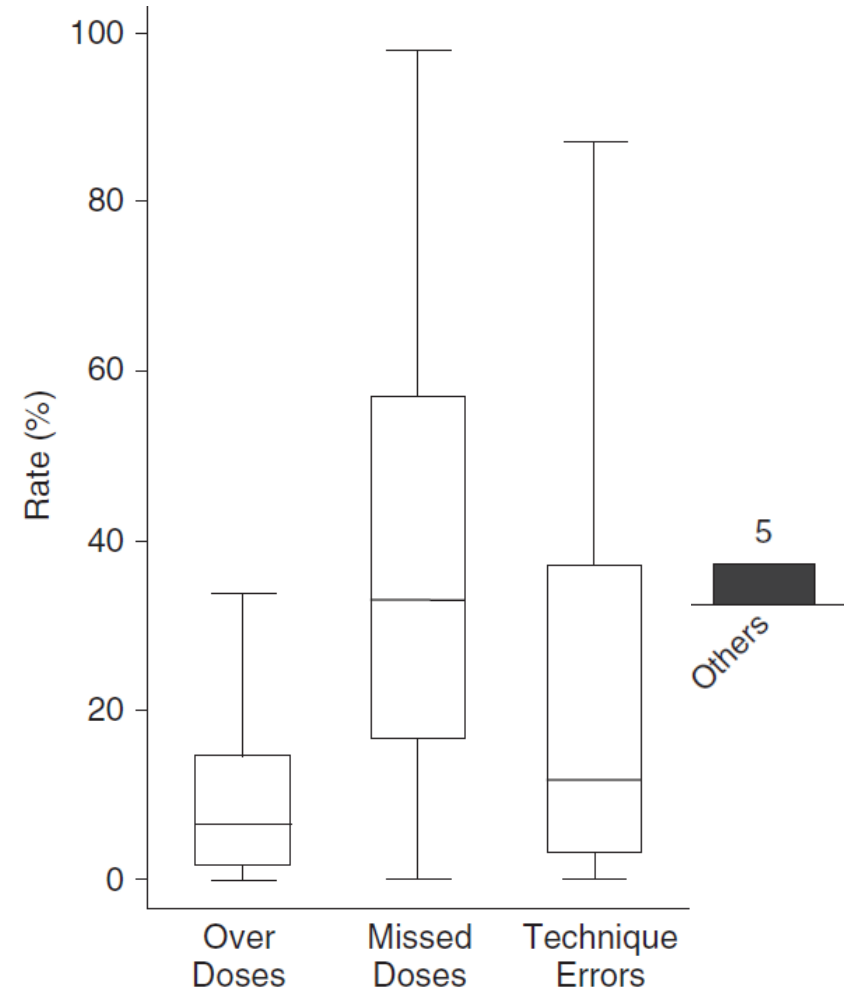
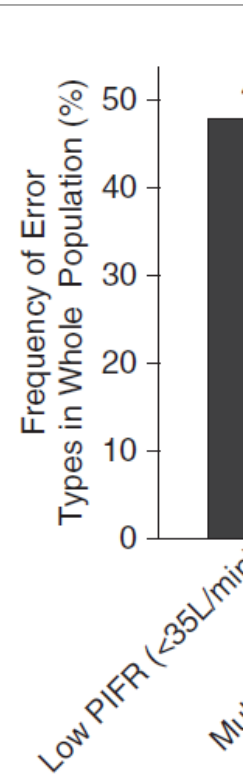


COPD Adherence



Objective Assessment of Adherence to Inhalers by Patients with Chronic Obstructive Pulmonary Disease

- Assessed Advair diskus adherence
- N=244; avg 71 yo; 30 days post-discharge
- 59% displayed mild-mod cog impairment
- INCA device assessed freq & proficiency
- Quantified intentional & unintentional errors
 - time of use
 - interval between doses
 - critical technique errors
- Mean actual adherence was 22.6%
- 6% had actual adherence >80%



COPD Update Summary

- Drug therapy has become targeted based upon “dyspnea” vs. “exacerbations”
 - Initial drug therapy is based upon ABCD box selections
 - Follow-up is also directed by absolute blood eosinophils (>300)
- ICS as a choice is becoming less of an “avoid” recommendation
- Triple therapy (ICS-LABA-LAMA) appears to reduce mortality
- Inhaled med adherence is poor
 - 22% overall; 6% take >80% of doses correctly
 - Technique (low PIFR) is 2nd most common problem

SHORT-ACTING BETA₂-AGONIST BRONCHODILATORS

relax tight muscles in airways and offer quick relief of symptoms such as coughing, wheezing and shortness of breath for 3-6 hours

ProAir® Digihaler™
90 mcg
albuterol sulfate
inhalation powder
NDA A



ProAir® HFA
90 mcg
albuterol sulfate
NDA A G



ProAir RespiClick®
90 mcg
albuterol sulfate
inhalation powder
NDA A



Proventil® HFA
90 mcg
albuterol sulfate
NDA A G



Ventolin® HFA
90 mcg
albuterol sulfate
NDA A G



Xopenex HFA®
45 mcg
levalbuterol tartrate
NDA A G



LONG-ACTING BETA₂-AGONIST BRONCHODILATORS

relax tight muscles in airways and offer lasting relief of symptoms such as coughing, wheezing and shortness of breath for at least 12 hours

Serevent® Diskus®
50 mcg
salmeterol xinafoate
inhalation powder
NDA A C



Striverdi® Respimat®
2.5 mcg
olodaterol hydrochloride
NDA C



INHALED CORTICOSTEROIDS

reduce and prevent swelling of airway tissue; they do not relieve sudden symptoms of coughing, wheezing or shortness of breath

Alvesco® HFA
80, 160 mcg
ciclesonide
NDA A



AmmonAir® Digihaler™
55, 113, 232 mcg
fluticasone propionate
inhalation powder
NDA A



Arnuity® Ellipta®
50, 100, 200 mcg
fluticasone furoate
inhalation powder
NDA A



Asmanex® HFA
50, 100, 200 mcg
mometasone furoate
NDA A



Asmanex® Twisteral®
110, 220 mcg
mometasone furoate
inhalation powder
NDA A



Flovent® Diskus®
50, 100, 250 mcg
fluticasone propionate
inhalation powder
NDA A



Flovent® HFA
44, 110, 220 mcg
fluticasone propionate
NDA A



Pulmicort Flexhaler®
90, 180 mcg
budesonide
inhalation powder
NDA A



QVAR® Redihaler™
40, 80 mcg
beclomethasone dipropionate
NDA A



MUSCARINIC ANTAGONISTS (ANTICHOLINERGIC)

relieve cough, sputum production, wheeze and chest tightness associated with chronic lung diseases

Short-acting

Atrovent® HFA
17 mcg
ipratropium bromide
NDA C



Long-acting

Incruse® Ellipta®
62.5 mcg
umeclidinium
inhalation powder
NDA C



Spiriva® HandiHaler®
18 mcg
tiotropium bromide
inhalation powder
C



Spiriva® Respimat®
1.25, 2.5 mcg
tiotropium bromide
NDA A C



Tudorza™ Pressair™
400 mcg
acridinium bromide
inhalation powder
NDA C



COMBINATION MEDICATIONS

contain both short-acting beta₂-agonist and short-acting muscarinic antagonist

Combivent® Respimat®
20/100 mcg
ipratropium bromide and albuterol
NDA C



COMBINATION MEDICATIONS

contain both inhaled corticosteroid and long-acting beta₂-agonist (LABA)

Advair Diskus®
100/50, 250/50, 500/50 mcg
fluticasone propionate and salmeterol xinafoate
NDA A C G



Advair® HFA
45/21, 115/21, 230/21 mcg
fluticasone propionate and salmeterol xinafoate
NDA A G

AirDuo® Digihaler™
55/14, 113/14, 232/14 mcg
fluticasone propionate and salmeterol xinafoate
inhalation powder
NDA A



AirDuo® RespiClick®
55/14, 113/14, 232/14 mcg
fluticasone propionate and salmeterol xinafoate
inhalation powder
NDA A G



Breo® Ellipta®
100/25, 200/25 mcg
fluticasone furoate and vilanterol
inhalation powder
NDA A C



Dulera®
50/5, 100/5, 200/5 mcg
mometasone furoate and formoterol fumarate dihydrate
NDA A



Symbicort®
80/4.5, 160/4.5 mcg
budesonide and formoterol fumarate dihydrate
NDA A C G



Wixela™ Inhub™
100/50, 250/50, 500/50 mcg
fluticasone propionate and salmeterol xinafoate (approved generic of Advair Diskus)
NDA A C



contain both long-acting beta₂-agonist (LABA) and long-acting muscarinic antagonist (LAMA)

Anoro® Ellipta®
62.5/25 mcg
umeclidinium and vilanterol
inhalation powder
NDA C



Bevespi Aerosphere®
9/4.8 mcg
glycopyrrolate and formoterol fumarate
NDA C



Duaklir® Pressair®
400, 12 mcg
acridinium bromide and formoterol fumarate
NDA C



Stiolto™ Respimat®
2.5/2.5 mcg
tiotropium bromide and olodaterol
NDA C



contain inhaled corticosteroid, long-acting beta₂-agonist (LABA) and long-acting muscarinic antagonist (LAMA)

Trelegy® Ellipta®
200/62.5/25 mcg, 100/62.5/25 mcg
fluticasone furoate, budesonide, umeclidinium and vilanterol
inhalation powder
NDA A C



Breztri Aerosphere™
160/9/4.8 mcg
budesonide, glycopyrrolate and formoterol fumarate
C



How do I remember them?

tinyurl.com/inhaledmedchart

Inhaled Medication Chart

Inhaled Asthma & COPD Medications 2022

maintained by Paul Thill, PharmD @ tinyurl.com/inhaledmedchart

S A B A s	Albuterol Nebulization	Generic, Accuneb	"Accuneb®" - 0.31, 0.63 mg & 1.25 mg/3 mL Generic - 2.5 mg/3 mL = 0.083%	Pre-mixed unit dose (3 mL); this lower dose usually not recommended Pre-mixed unit dose (3 mL); also available as 0.5 ml to add to other agents or NS for nebulization
	Albuterol	ProAir (& Respiclick), Ventolin, Proventil MDI	90 mcg/puff; typically 200 puffs/inhaler	MDI; should be used with a spacer; shake 5 seconds; 4 primes to start; reprime after 2 wk without use or if dropped; expires 6 mo after opening: ProAir comes in both HFA (MDI) and Respiclick® DPI
	Levalbuterol	Xopenex HFA & Neb	45 mcg/puff (200); 0.31, 0.63 or 1.25 mg/unit dose	MDI: Shake 5 seconds; 4 primes to start; reprime after 3 days without use; Unit dose for neb; must use as soon as foil wrapper is opened; no advantage over racemic albuterol (efficacy or side-effects)
I C S	Beclomethasone	Qvar Redihaler	40 or 80 mcg/actuation (120)	MDI only for use without spacer (no shaking required)
	Budesonide	Pulmicort flexhaler DPI	90 mcg/puff (60); 180 mcg/puff (120)	Counter increments of 10; moves every 5; twist to the right, then left to load; do not tip once loaded
		Pulmicort, generic	0.25, 0.5 or 1 mg/unit dose nebulizer vial	Deliver with mask if <3 yr ; older child may use a mouthpiece; expires 2 wks after open
	Fluticasone propionate (FP) Fluticasone furoate (FF)	Flovent, ArmonAir DPI	50, 100, 250 mcg, 55, 113, 232/puff (60)	Dry powder inhalers; No priming; do not tip once loaded; avoid humidity & moisture
		Flovent HFA (FP)	44, 110 or 220 mcg/puff (120)	MDI; shake for 5 seconds; 4 puff priming; reprime after 7 days w/o use or if dropped
	Arnuity Ellipta DPI (FF)	50, 100 or 200 mcg/puff (30)	1 puff daily ; Fluticasone furoate different dosing vs. Flovent above; only for asthma; 50 mcg for 5-11yo	
Mometasone	Asmanex twisthaler DPI; Asmanex HFA	220 mcg (30,60, 120); 110 mcg/puff DPI (30); 50, 100 & 200 mcg HFA (120)	Lid will lock on DPI when counter goes to "0"; HFA 50mcg is for peds 5-11yo; DPI 110mcg is for 4-11yo	
Ciclesonide	Alvesco HFA	80 or 160 mcg/puff (60)	1 puff 2x/day; shaking not required; 3 puffs to prime; reprime 10d unused; counter moves every 10 puffs	
	Salmeterol	Serevent Diskus DPI	50 mcg/actuation (60)	No priming; do not tip once loaded; avoid humidity; expires 6 wk after open
L A B A	Formoterol	Perforomist Neb	20 mcg nebulization	COPD indication only
	Arformoterol	Brovana Neb	15 mcg ampule	COPD indication only
	Olodaterol	Striverdi Respimat	2.5 mcg/puff (60)	2 puffs/dose once daily; 60 dose inhaler ; see Combivent respimat for device specifics
I C S / L A B A	Fluticasone propionate (FP)/ Salmeterol	Advair Diskus , GEQ	100/50, 250/50 or 500/50 mcg/puff (60)	Also available in several generic versions (Wixela , non-branded)
		Wixela Inhub DPI	100/50, 250/50 or 500/50 mcg/puff (60)	Generic equivalent for Advair DPI (same dosing), other generics also available
		Advair HFA	45/21, 115/21 or 230/21 mcg/puff (124)	Same as Flovent HFA except reprime @ 4 wk without use or if dropped
		AirDuo Respiclick DPI	55/14, 113/14, 232/14 mcg/puff (60)	Dose is 1 puff twice a day ; also available as less expensive as "unbranded" version
	Fluticasone (FF)/ Vilanterol	Breo Ellipta DPI	100 mcg/25 & 200/25 mcg/puff (30)	1 puff daily; Indicated for COPD (100/25 dose) and asthma (≥18 yr old)
	Budesonide/ Formoterol	Symbicort HFA	80/4.5 or 160/4.5 mcg/puff (120)	MDI; use with spacer; shake 5 seconds; 2 primes to start, reprime after 7d without use
Mometasone/ Formoterol	Dulera HFA	50 mcg/5 mcg, 100 mcg/5 mcg, 200 mcg/5 mcg (120)	MDI; use with spacer; shake 5 seconds; 4 primes to start, reprime after 5d without use; do not use more than BID; expires 90 days after opening	
L A M A	Umeclidinium/ Vilanterol	Anoro Ellipta DPI	62.5 mcg/25 mcg/puff (30)	LAMA/LABA combo for COPD; 1 puff daily; technique same as other Ellipta inhalers
	Tiotropium/ Olodaterol	Stiolto Respimat	2.5 mcg/2.5 mcg/puff (60)	LAMA/LABA combo for COPD; 2 puffs/dose; 1 dose daily; same as other Respimat devices
	Glycopyrrolate/ formoterol	Bevespi MDI	9 mcg/4.8 mcg/puff (120);	2 puffs twice a day – only MDI LAMA/LABA combo for COPD (can be used with a spacer)
A N T I - M u s c	Ipratropium	Generic, Atrovent MDI/Neb	17 mcg/puff (200); Nebulization 0.5 mg/3ml	SAMA; Prime x2 at first and if unused >3 days; counter goes down every 5 puffs
	Ipratropium/albuterol	Duoneb Neb	0.5 mg/3mg/3 ml nebulization	SAMA/SABA; given via nebulizer; can be used in acute asthma, but mostly for COPD.
	Ipratropium/albuterol	Combivent Respimat	20/100 mcg; (120 puffs)	Typical dose 1 puff q6h prn; if unused for a significant period, reprime; locks when counter reaches "0"
	Tiotropium	Spiriva DPI, Respimat	18 mcg DPI; 2.5 mcg and 1.25 mcg/puff MDI (60)	LAMA; 2 puffs/dose daily for respimat; 2.5 mcg is for COPD; 1.25mcg is for asthma step 4+ in 6yo or older
	Umeclidinium	Incruse Ellipta DPI	62.5 mcg/puff (30 puffs/inhaler)	LAMA; 1 puff daily; Ellipta instructions same as other Ellipta products
	Glycopyrrolate	Lonhala Neb	25 mcg/1mL nebulized	LAMA; 1 ampule nebulized twice a day via dedicated Magnair nebulized compressor
	Revefenacin	Yupelri	175 mcg/3 ml nebulization	LAMA; 1 ampule daily nebulized via standard jet neb/compressor
3in1	Umecl/Vilant/Flutic (FF)	Trelegy Ellipta	62.5/25/100 mcg & 62.5/25/200 mcg	LAMA/LABA/ICS 1 puff daily; 100 mcg is for COPD & asthma; 200 mcg is for up-titrating dose in asthma only
	Budes/Glycopyrr/Formot	Breztri MDI	160 mcg/9 mcg/4.8 mcg	LAMA/LABA/ICS 2 puffs twice a day



I have
questions...
do you?
